Economy and Environment Program
for Southeast Asia
Tanglin PO Box 101
Singapore 912404

Phone: (65) 6831-6854
Fax: (65) 6235-1849
E-mail: eepsea@idrc.org.sg
Web site: www.eepsea.org

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Lao PDR, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Vietnam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

EEPSEA Policy Briefs summarize the key results and lessons generated by EEPSEA-supported research projects, as presented in detail in *EEPSEA Research Reports*.

EEPSEA Policy Briefs and Research Reports are available online at http://www.eepsea.org.

Benefits from By-products: Recycling Distillery Wastes for Sugarcane Production

EEPSEA POLICY BRIEF • No. 2003 - PB11

As Southeast Asia industrializes, the need for innovative ways to get rid of waste has increased. A new report from the Philippines shows how a factory waste that has been polluting the country's rivers can be turned into a valuable resource that can help farmers improve their productivity. →

A summary of EEPSEA Research Report 2003-RR11, Economic and Environmental Impacts of Using Treated Distillery Slops for Irrigation of Sugarcane Fields by Nerlita M. Manalili, Rodrigo B. Badayos and Moises A. Dorado (Agro-Industrial Development Program, SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA), College, Los Banos, Laguna 4031 Philippines. Contact: nmm@agri.searca.org)

The slop has economic

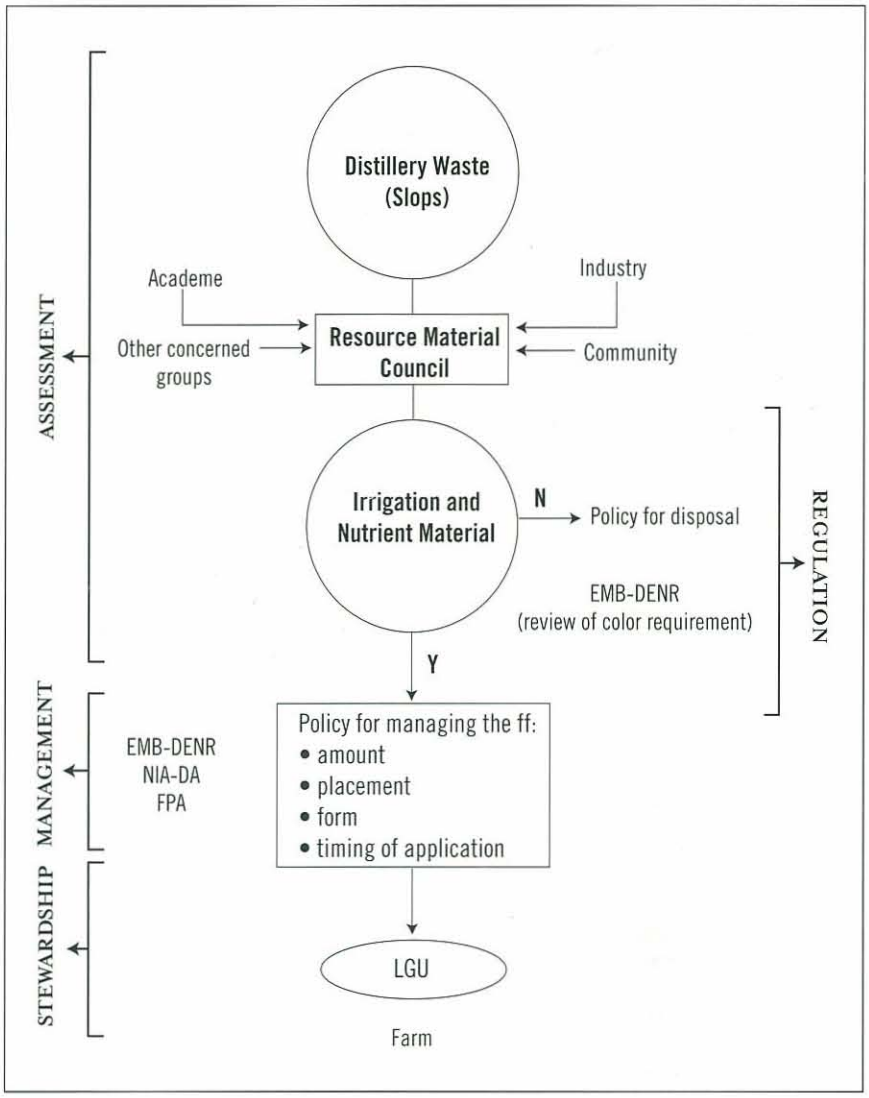
The report was prepared by Nerlita M. Manalili, Rodrigo B. Badayos and Moises A. Dorado from the SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA), Los Banos in the Philippines.

The researchers investigated various treatment and disposal options for the slops that are produced during the distillation of sugarcane. They found that when the slops are treated optimally they can be used as an effective fertilizer and irrigation resource. This not only benefits farmers by increasing yields, but also removes a heavy financial burden from the sugar cane processing companies in terms of pollution cleanup costs or fines.

The pollution challenge

The study was undertaken against a background of rising concern about industrial pollution in the Philippines. This is particularly true in the sugarcane distillery sector, where factories have been threatened with closure if they do not stop dumping their slop wastes into rivers. Distilleries produce huge amounts of these slops as part of the alcohol production process. The raw slops are high in BOD and usually very dark in colour. This makes treatment necessary before the wastes can be disposed of into the environment. Unfortunately, this is often not done effectively and there has been widespread public outcry at the pollution that has resulted.

SEARCA responded to these by carrying out a preliminary study to see if treated distillery slops would enhance soil and make good irrigation water. The results were encouraging and as a result, many farmers have been using the slops to replace expensive chemical fertilizers. Because of this, Manalili, Badayos and Dorado decided to investigate how this waste disposal option could be optimised and whether it could be sustainable in the long-term, both economically and ecologically.



Recommended Process of Assessment and Management of Slops as Resource Agricultural Material

Note: NIA-DA – National Irrigation Administration-Department of Agriculture
FPA – Fertilizer and Pesticide Authority

Which treatment is best?

The researchers investigated a range of treatment options for the sugarcane slops to find out which would best balance the needs of the

value *for agricultural use*

distilleries, farmers and the environment. Their goal was to find a treatment option that would have minimal costs for the distillery, produce maximum increases in crop yields for farmers and have as little pollution impact on the environment as possible.

They conducted their study in Lian, Batangas, the same site where the previous SEARCA research had been carried out and an area where the use of slops for irrigation is now well established. There are currently three alcohol distilleries in the area but only two are operating. Only one of the three distilleries in the area has treatment facilities that meet government standards. The researchers also decided to extend their research to the sugarcane industry in Vietnam, a country that faces similar environmental concerns related to its sugar refineries and distilleries. The Binh Loi Village in Binh Chanh District was selected as the study site since slops are readily available and there are extensive sugarcane fields where slops can be utilized. The Vietnamese study was set up to explore the technical scope of slop utilization at different stages of crop growth.

Costing the options

The researchers investigated the costs and impacts of five different treatment regimes in the Philippines. These options ranged from doing nothing (applying untreated slops, after cooling them in ponds, directly to the fields) to full anaerobic and aerobic treatment of all sugarcane distillery wastewater, along with the recycling of wastewater and the use of treatment and settling lagoons.

To get a picture of how a proper waste treatment program would affect the distillery industry, Manalili, Badayos and Dorado investigated the plant in Lian that has a state-of-the-art water treatment system already in place. Using data from the plant's operations, they evaluated the benefits and costs of each option for the distillery.

Impacts on farmers and the environment

The team also carried out a financial analysis at the farm level to work out the impact of each option on the farming sector. They surveyed twenty-two farmers who use treated slops and four farmers who use untreated slops. All the farmers cultivated sugarcane. They also investigated the changes in crop production, water availability and residual soil fertility that resulted from slop application. They then used a market-based method to measure the economic value of these changes. The impacts of slop application on the environment were valued by calculating how much it would cost the polluter (i.e. the distilleries) to clean up rivers and groundwater after they had received runoff from treated agricultural land. To do their calculations, the researchers first measured the quality of the rivers adjacent to the farms. Then they measured the quality of runoff water from several randomly selected plots. A simple simulation was also performed to predict possible BOD loading downstream from the farms.

Results show that slops work

Not surprisingly, the cost of adopting the different waste management alternatives increased as more processes and treatments were used. The total cost of implementing the waste management options ranged from PHP 885,806 (USD 16,959) to PHP 110,610,697 (USD 2,117,686). The researchers found that the benefits to the distillery from using these techniques would come mainly in the form of reduced fines or cleanup costs. The cleanup costs (of both rivers and groundwater) when no treatment was used came to PHP 106,532 (USD 2,039) per hectare of slop-irrigated field. The same costs when full treatment was implemented were only PHP 51,550 (USD 987). The results of the financial analysis showed that the distillery realized the greatest net benefit when the slops received a combination of anaerobic and aerobic treatment with recycling and process improvement before the slops are applied to sugarcane fields.

The benefits to farmers

From the farmers' point of view, the main benefit of using slops was an average increase in sugarcane yield of 28 tonnes per hectare. The net benefit of this was valued at PHP 23,240 (USD 445). The improvement to residual soil fertility was valued at PHP 53,736 (USD 1,029) per hectare. Although more labour was needed to monitor slop

application and control weeds, there was also a decrease in fertilizer costs thanks to the extra nutrients provided by the slops. Overall, the researchers found that if all the costs and benefits to the wider community and the environment are included, then the best treatment option for the slops was aerobic treatment alone. This is due to the relatively high investment needed for the other treatment alternatives; these outweighed the additional benefits they brought.

In Vietnam, the researchers found that the application of raw slops to standing crops created some adverse effects (although the canes recovered in time for harvest). These results showed an unforeseen limitation of the technology, since previous experiments had looked only at the effects of slops on newly planted crops.

The government should support slop use

Overall, Manalili, Badayos and Dorado showed that the slop produced by sugarcane distillation has economic value for agricultural use and that its environmental effects can be mitigated. However, they felt that if this resource is to be fully exploited there is a need for policy adjustments especially those governing the status of the slop as a resource or a waste. In particular, the researchers recommend that there needs to be a shift from the regulatory stance of the government in controlling the disposal of slops to a more supportive partnership between the industry, the government, and the community. This will require the review of policies that penalize firms for discharging slops and the introduction of new standards that encourage the recycling of slops as agricultural fertilizers. They also recommend research into the use of slops on other crops and soil types. Overall, they see great potential for a technology that benefits processors, farmers and the environment.

EEPSEA is an international secretariat administered by Canada's International Development Research Centre (IDRC) on behalf of EEPSEA's sponsors:

IDRC CRDI
International Development Research Centre
Centre de recherches pour le développement international

Canadian International Development Agency
Agence canadienne de développement international

Sida
Swedish International Development Cooperation Agency